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## APPENDIX F

### Primary Aquatic Sites Within the Black River State Forest / Meadow Valley Landscape

Aquatic Site descriptions have been arranged alphabetically by waterbody name. These descriptions are limited to physical and biotic aspects of each site that pertain to aquatic features. Several of the Terrestrial Sites described in Appendices B-G contain additional information for terrestrial features that are associated with these aquatic sites and repeat some aquatic species mentioned here.

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## AQ01. BRANDY CREEK

### **Location**

Subsection: Central Wisconsin Sand Plain (222Ra)  
USGS 7.5' Quadrangle: Wyeville, and Tunnel City.  
Town-Range-Section: T18N-R1E, parts of Sections 7-9; T18N-R1W, parts of Sections 1-2, 12, 33; and T19N-R1W, parts of Sections 28, 33-35.  
Size: Linear feature approximately 7.2 mi. long; about 5 mi. are in the study area.

### **Description of Site**

A soft slightly acid brown tributary to Mill Creek. Sand and silt are the predominate substrates. Average width is 8ft. The site begins as a 1<sup>st</sup> order stream in upland forest of the Melrose Oak Forest and Savanna south of Warrens. Here it is cool enough to support trout. It is immediately impounded by two dams as it leaves the bluff lands of origin. After a few miles it reaches the Central Wisconsin Sand Plain and then flattens out. Here it has natural conditions for about a mile and a half. Downstream it is impounded for a cranberry operation, and below that to its mouth it is ditched.

### **Significance of Site**

Middle section below the cranberry marsh is remarkably rich in abundance and diversity of aquatic invertebrates and stood out among the other streams sampled in the eastern part of the study area. The riffle areas had good populations of lotic species, and the shoreline areas, with their overhanging vegetation and undercut banks, had rich populations of predominantly lentic species. This stream may be a biotic refuge for aquatic macroinvertebrates for the general area, especially for lentic species that fly to streams to overwinter or avoid drought. The Special Concern water scorpion *Nepa apiculata* was discovered along the shoreline. While only sampled once, this site featured 39 aquatic invertebrate species including three Special Concern taxa, one of which is restricted to a few small, cool sandy streams in Wisconsin.

### **Management Considerations**

This stream site is included because of the richness of aquatic invertebrate taxa despite a number of factors apparently causing degradation. Ditching, numerous impoundments and runoff were noted by field surveyors as the primary causes of degradation. Considerable silt was also noted. The upper section was formerly classified as a trout stream but is no longer being managed as such.

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## AQ02. BLACK RIVER

### ***Location (Within the study area)***

- Subsection: Central Wisconsin Sand Plain (222Ra), Neilsville Sandstone Plateau (222Rb), and Melrose Oak Forest and Savanna (222Lb)
- USGS 7.5' Quadrangle: Hatfield, Merrilan, Black River Falls, and Melrose.
- Town-Range-Section: T20N-R4W, parts of Sections 5, 8, 16-17, 20, 30-31; T21N-R4W, parts of Sections 1-2, 11, 14-15, 22, 27-28, 33; and T22N-R3W, parts of Sections 2-3, 9-10, 16-17, 20, 29-31; T22N-R4W, parts of Section 36; T23N-R3W, parts of Sections 35-36.
- Size: Linear feature approximately 148 mi. long; about 30 mi. are in the study area (~12 mi. are in the Black River State Forest).

### ***Description of Site***

A fast, large (6<sup>th</sup> order) warm soft water stream with light brown water that borders the western edge of the study area and is the major stream in the area. Below Black River Falls, the Black River flows 62 miles without impoundment to the Mississippi. From the beginning of this segment at Lake Arbutus downstream to Black River Falls (about 13 river miles) the substrate is predominately gravel, boulders, rubble, bedrock and sand. At Black River Falls the river begins cut into sedimentary rather than igneous rock. As a result, the river here quickly flattens out and the bottom is dominated by gravel and sand downstream through the rest of the study area (to the Jackson/Monroe county border - about 17 river miles). In the Central Plain portion of its course, the Black River has formed a shallow steep sided trench, which is about 50 - 75 ft. lower than the adjacent uplands. As a result tributary streams from the east (which are generally low gradient) here descend rapidly cutting deep narrow gorges in their last few miles before entering the Black. Due to the large area of agricultural use of the watershed upstream of the study area, the narrowing of the river valley in the study area and flow manipulations due to the hydroelectric plant at Hatfield, the Black River is very subject to extreme fluctuations in flow and water levels.

### ***Significance of Site***

The 30 miles of Black River in the study area are very rich and contain about 200 species of macroinvertebrates including one Endangered, two Threatened and 18 Special Concern species. Five of the invertebrate species present are considered globally rare or imperiled. Fish diversity is also significant with 72 species, including 4 Threatened and 3 Special Concern species - two of which are globally rare. Mussel diversity was highest of the study area streams sampled with 13 species found alive including one Threatened and one Special Concern species. However densities were relatively low, and one species (*Cyclonaias tuberculata*) was only represented by dead shells. Much of the fish and mussel diversity is limited to the section below the dam at Black River Falls where substrate diversity and connectivity are greater. Also present here is a significant population of the state Threatened wood turtle, although numbers are greatly diminished since 1994.

### ***Management Considerations***

Flow fluctuations, both natural and those related to operation of two hydroelectric plants and high percentage of agricultural land in the watershed, are the primary management concerns. In the section above Black River Falls much of the river bottom is scoured by high flow extremes with the result of bare bedrock and unstable sand substrates. Over two miles of river channel directly below the Hatfield dam are de-watered by diversion of flow through a pipe for hydroelectric operation. Below Black River Falls flow fluctuations and riprapping of sandbanks appear to be the major concerns. Also some large-scale rock and sand quarries are situated very close to the river, both above and below Black River Falls. During this project inventory staff noted significant

turbidity, silt and sediment, livestock pasturing, barnyard runoff, septic systems, and urban and construction runoff as factors negatively affecting water quality.

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## AQ03. EAST FORK BLACK RIVER

### *Location*

Subsection: Neilsville Sandstone Plateau (222Rb)

USGS 7.5' Quadrangle: Hatfield, Hatfield NE, City Point NW, City Point, City Point NE, Spaulding, Pittsville, Lindsey.

Town-Range-Section: T22N-R1E, parts of Sections 19-22, 25-27; T22N-R2E, parts of Sections 4, 10, 14-15, 21-23, 28-30, 32; T22N-R1W, parts of Sections 5-11, 13-14, 24; and T22N-R2W, parts of Sections 1-6, 31, 36.

Size: Linear feature approximately 44 mi. long; about 32 mi. are in the study area (3.3 mi. are in the Black River State Forest).

### *Description of Site*

A medium-sized (5<sup>th</sup> order) warm, fast, brown-water stream with very soft water that approximately parallels the north edge of the study area. The bottom is mostly sand with rubble, bedrock, and silt also present. Alternating long pools and riffles are characteristic of much of this stream. A few rapids are found in the lower 10-12 miles before the river enters Lake Arbutus. With the exception of cranberry operations in the City Point area, the watershed and shoreline are mostly forested or natural wetlands, especially in the study area. Annual fluctuations in flow are great.

### *Significance of Site*

The major stream in the northern part of the study area, the East Fork has high macroinvertebrate diversity with 107 species including ten of Special Concern and three globally imperiled. There are also 30 fish species present, but none with special status. Along the East Fork Campground below the last rapids downstream to Lake Arbutus containing the best density of freshwater mussels in study area and good diversity with eight species (three Special Concern). Also found in this area are a series of open and partially wooded seeps which harbor two Special Concern beetle species.

### *Management Considerations*

Good perceived water quality with no significant pollutant sources or habitat problems noted during this survey. Much of the headwaters in Clark County are considered intermittent. Increase of protective ownership or management in the watershed would help insure the viability of this system.

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## AQ04. HALLS CREEK

### *Location*

Subsection: Central Wisconsin Sand Plain (222Ra) and Neilsville Sandstone Plateau (222Rb)  
USGS 7.5' Quadrangle: Fair Child, Alma Center, Merrilan, and Black River Falls.  
Town-Range-Section: T22N-R3W, parts of Sections 6-7, 18-19, 30; T22N-R4W, parts of Sections 1, 12-13, 15-18, 22, 25-27, 35-36; and T22N-R5W, parts of Sections 1-2, 12-13, 21, 27-28, 34-35.  
Size: Linear feature approximately 18.7 mi. long; about 4.3 mi. are in the study area boundary (0.75 mi. are in the Black River State Forest).

### *Description of Site*

A small to moderately sized (5<sup>th</sup> order), light brown, very soft stream that originates in the Western Coulee and Ridges Ecological Landscape and is tributary to the Black River. The upper portion above Trow Lake Dam (a.k.a. Stockwell Creek) is predominantly sandy with a variety of other substrates. This section has a number of negative impacts including urban runoff, two impoundments, and a significant amount of agricultural land in the watershed. Below Trow Lake, Halls Creek is better protected and this is where the ecologically significant features are found. Here the substrate is more diverse with gravel, bedrock, rubble, sand and boulders. The lower few miles are deeply entrenched with steep slopes or cliffs with seeps and meander ponds adding to habitat diversity.

### *Significance of Site*

Ninety species of aquatic invertebrates and 28 fish species (none with special status) have been found here including 10 Wisconsin Special Concern taxa (of which three are globally rare). The eight species of mussels is high for a stream this size.

### *Management Considerations*

Poor condition of the watershed above Trow Lake and two permanent dams are the major management concerns. There also is an abandoned dam at SW1/4 S18 T22N R3W, Jackson County (Camp Bradfield) which still maintains a three-foot head due to the remnant structure.

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## AQ05. HAY CREEK

### *Location*

Subsection: Central Wisconsin Sand Plain (222Ra)  
USGS 7.5' Quadrangle: Hatfield, and Hatfield SW.  
Town-Range-Section: T22N-R2W, parts of Sections 29, 30, 32; T22N-R3W, parts of Sections 22-25.  
Size: Linear feature approximately 5.5 mi. long; all are in the study area (4.8 mi. are in the Black River State Forest).

### *Description of Site*

This small stream originates in open wetlands in the Central Sands and is immediately impounded to form the Staffon Flowage. Below the flowage the stream is un-dammed although the WDNR Dam Database shows a dam (Amos Elliott Dam) near its mouth at Morrison Creek (nothing was noted in 1997). The water is very soft and medium brown in color. Trout were not recorded but some of the invertebrates found in the lower section are indicative of cold water. Upstream the predominant bottom type is sand with small amounts of gravel and rubble. Downstream the amount of rubble and gravel increases. Lowermost portion of creek is 2<sup>nd</sup> order in size and is somewhat entrenched with small seeps exposed along the banks.

### *Significance of Site*

This stream was chosen by the WDNR Regional Fish and Habitat Program as a reference site because of the intact condition of this small stream system and to monitor change due to a cranberry marsh in the headwaters. Ninety species of aquatic invertebrates and seven fish (none with special status) have been recorded, but one species is considered globally rare.

### *Management Considerations*

Cranberry operations near the headwaters of Hay Creek have the potential to cause decreased flow, increased water temperature and chemical contamination downstream. are cause for and impoundments near the headwaters are the primary concern for this stream.

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## AQ06. HEMLOCK CREEK

### *Location*

Subsection: Central Wisconsin Sand Plain (222Ra)  
USGS 7.5' Quadrangle: Babcock, Lake Dexter, Vesper, Sherry, and Arpin.  
Town-Range-Section: T21N-R3E, parts of Sections 1, 12-13, 23-24; T22N-R3E, parts of Sections 25, 26; T22N-R4E, parts of Sections 4-5, 8, 17, 19-20, 30-31; T23N-R4E, parts of sections 1, 12-14, 22-23, 27, 33-34; T23N-R5E, parts of Sections 6-7.  
Size: Linear feature approximately 26.2 mi. long; about 10.4 mi. are in the study area.

### *Description of Site*

A small, 4<sup>th</sup> order, light brown, soft, warm water stream originating in agricultural uplands north of the study area and tributary to the Yellow River. Sand, gravel and rubble are the predominate bottom types. As it enters the Central Sands the stream channel becomes highly meandered and divided forming an unusual complex of wooded islands and extensively braided channels.

### *Significance of Site*

This stream is known to harbor 54 aquatic invertebrate and 21 fish species including the State Threatened redbfin shiner. The unique physical nature of the lower half provides a variety of habitats for aquatic and wetland species.

### *Management Considerations*

A dam and flowage are upstream of the study area. Cranberry flowages drain directly into Hemlock Creek in the study area and are potential sources of decreased flow, increased water temperature and chemical contamination in Hemlock Creek.

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## AQ07. JAY CREEK

### *Location*

Subsection: Central Wisconsin Sand Plain (222Ra)  
USGS 7.5' Quadrangle: Warrens West, Warrens East, and Wyeville.  
Town-Range-Section: T19N-R1W, parts of Sections 2-3, 10-13; T20N-R1W, parts of Sections 16, 21, 28, 33-34; T19N-R1E, parts of Sections 7, 18.  
Size: Linear feature approximately 9.7 mi. long; all are in the study area.

### *Description of Site*

Jay Creek originates in the uplands just south of Knapp Mound and then flows through extensive wet forest for several miles. East of Warrens the creek is impounded as it enters a huge complex of cranberry marshes. The water is very soft and light brown with a moderate flow. Soft sand and muck are the predominate substrates. Undercut banks in highly meandered areas and oxbows in wet forest riparian zones offer additional habitat for aquatic organisms. Cold and cool water species are supported.

### *Significance of Site*

Unlike many streams in the study area, Jay Creek is not impounded in its upper reaches. Also, the watershed appears to be in a relatively natural condition. Limited sampling has found 20 macroinvertebrate species including two Special Concern dragonflies and four fish species (none with special status). One of the dragonflies is a southern species which is very rare dragonfly in Wisconsin and another is a rare dragonfly associated with northern streams. About one and one half miles of stream frontage of Jay Creek and tributaries are protected as part of the Jay Creek State Natural Area.

### *Management Considerations*

Continue to maintain the BRSF portion of watershed in a natural condition and expand acreage designated as State Natural Area upstream of the existing SNA.

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## AQ08. MADISON CREEK

### *Location*

Subsection: Central Wisconsin Sand Plain (222Ra)  
USGS 7.5' Quadrangle: Millston.  
Town-Range-Section: T20N-R3W, parts of Sections 21-22, 28.  
Size: Linear feature approximately 1.5 mi. long; all are in the study area.

### *Description of Site*

A 1<sup>st</sup> order cold, soft headwater stream originating in the sloped forested wetlands south of Oak Ridge and tributary to Robinson Creek. There are a number of very old beaver impoundments in the headwaters - some of them still active and providing a series of ponds. Open herbaceous vegetation borders the stream and impoundments.

### *Significance of Site*

Brook trout and 36 species of aquatic invertebrates, including two SC taxa, were detected in the one survey done during this project. Although small, this stream appeared to be little altered by human activity and supported high invertebrate diversity for a cold water system.

### *Management Considerations*

Beaver impoundments in this system appeared to be very old and undoubtedly add to the diversity of this site. Removal of beaver dams would not be recommended at this time. Maintenance of the overall forested or barrens landcover in the watershed would help maintain the quality of this site.

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## AQ09. MORRISON CREEK SYSTEM

### *Location*

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Hatfield NE, Hatfield SW, Hatfield SE, Hatfield, and Spaulding.
Town-Range-Section:	T21N-R1W, parts of Sections 7, 10-12, 15-17; T21N-R2W, parts of Sections 1-2, 12; T22N-R2W, parts of Sections 12, 13-18, 19-20, 27-29, 34-35; and T22N-R3W, parts of Sections 18, 23-24.
Size:	Linear feature approximately 25.3 mi. long; all are in the study area (15.8 mi. are in the Black River State Forest).

### *Description of Site*

**This site includes Mollies and Pollies creeks.**

Morrison Creek is a very soft, medium sized (5<sup>th</sup> order), brown-water stream. An excellent variety of substrates are present, especially in the last few miles, and include sand, boulder, bedrock, rubble, gravel, and silt. The headwater area includes the extensive wetlands forming the Bear Bluff complex in the Central Plain as well as uplands along State Trunk Highway 54. East of the Black River State Forest, Morrison Creek is impounded by the Potter Flowage, and a number of associated cranberry bogs are located here. Shortly after it enters the State Forest its southern tributaries are impounded by the series of flowages in the Dike 17 Wildlife Area.

A significant tributary on the BRSF is the nearly eight mile long Mollies Creek. This is also a very softwater stream with brown water. The upper half of Mollies is ditched but appears to be recovering its former channel in places. The lower half-mile of Mollies is entrenched in sandstone as it approaches Morrison Creek. There is a small scenic waterfall in this segment. Just above the waterfall a very cold clear softwater tributary joins Mollies Creek.

Morrison Creek itself is not impounded in its last 24 miles. Above Oxbow Pond an uncommon softwater spring emerges near the bank and flows a few feet into Morrison Creek. Below Oxbow Pond the Morrison valley becomes noticeably more entrenched resulting in a dramatic gorge below CTH K to the Ho Chunk Indian Reservation. Here the stream enters a terrace where it meanders through lowland forest for its last mile before entering the Black.

### *Significance of Site*

This stream was included because its lower section has excellent macroinvertebrate diversity (41 species) and composition for a waterbody this size. Four species are Special Concern; one of these is globally imperiled and two are globally rare. In addition some 21 fish species (none with special status) are found here. Mollies Creek has some 10 fish species (none with special status). No mussel species were found, probably because the water temperature is too low on average. A wide range of additional aquatic habitats related to the stream valley are found here including oxbows, floodplain wetlands, seeps, and at least one softwater spring and spring run.

### *Management Considerations*

Flowages and ditches in the headwaters are the major concerns. Some of these are related to Cranberry marsh operation, some to the Dike 17 Wildlife Area and some have no current utility. Removal of flowages should be considered whenever feasible as has already happened on Black River State ownership.

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## AQ11. PERRY CREEK

### *Location*

Subsection: Central Wisconsin Sand Plain (222Ra)  
USGS 7.5' Quadrangle: Black River Falls.  
Town-Range-Section: T21N-R4W, parts of Sections 26-27, 34-35.  
Size: Linear feature approximately 2.8 mi. long; all are in the study area (and all are in the Black River State Forest).

### *Description of Site*

Perry Creek originates in Central Poor Fens just southwest of the old Jackson County Iron Mine. As these wetlands coalesce into surface flow as unnamed streams, they are impounded by an extensive system of cranberry flowages. The portion of this system named Perry Creek begins below the flowages and is only two miles long. Here the stream becomes entrenched in sandstone bedrock creating a steep valley with long sections of low, wet moss covered cliffs. Water is cold, light brown, and very soft warming to a cool water stream in the lower section. Sand and muck are predominant substrates in the upper section changing to shallow sand and gravel or sandstone bedrock downstream.

### *Significance of Site*

High diversity of aquatic invertebrates (39 species) for a cool water system plus at least six fish species (none with special status) are known. Above the flowages the tributary streams are considered trout waters. Included in this site is a stretch of wet sandstone cliffs, which support a number of very rare aquatic insects. These rare taxa include two species of water scavenger beetles, a hebrid bug only previously know from one site in Wisconsin, and a state record caddisfly. This caddisfly is madicolous, living in very shallow water where there is a continuous coat of diatoms, other algae, and a cushion of moss or liverworts through which the water trickles. This is the first record of this species anywhere in 57 years, and represents one of only three sites known anywhere. The stream proper has one dragonfly species considered globally imperiled.

### *Management Considerations*

Some significant turbidity was noted during one sample session done for this project. The proximity of Perry Creek Road to wet sandstone cliffs is of concern because of potential erosion, incompatible road maintenance, or vehicular accidents. The degree of headwater alteration is extensive and restoration should be considered.

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## AQ12. ROBINSON CREEK

### *Location*

Subsection:	Central Wisconsin Sand Plain (222Ra)
USGS 7.5' Quadrangle:	Shamrock, Millston, and Warrens West.
Town-Range-Section:	T20N-R2W, parts of Sections 19-23; T20N-R3W, parts of Sections 19-24, 28-29; and T20N-R4W, parts of Sections 15-16, 22-24.
Size:	Linear feature approximately 16.5 mi. long; all are in the study area (5.2 mi. are in the Black River State Forest).

### *Description of Site*

A medium sized (4<sup>th</sup> to 5<sup>th</sup> order) stream with light brown, very soft, cool water with mostly sand substrate. Other substrates include bedrock in the lower section, with silt and gravel scattered throughout. The stream originates as about 12 headwater streams coming out of a portion of the Overmeyer Hills between Warrens and Millston. These streams quickly coalesce in an unnamed flowage. Below this flowage drainage from another flowage (Harkner Flowage) joins as Rudd Creek. The stream segment named Robinson Creek originates in the extensive Starlight Wetlands complex of the Central Sands as the outlet of a large unnamed flowage and in its first few miles has several cranberry flowages as tributaries. The stream meanders through a shallow, sterile sandy valley below Millston where its banks define a narrow zone of more mesic vegetation, which includes numerous seeps, alder thickets, and White Pine Red Maple Swamp. Below Millston, its southern tributaries originate in the Western Uplands. Over two miles above STH 27 Robinson Creek forms a series of shallow bedrock rapids and falls and forms a steep sided valley as it descends rapidly to its mouth at the Black River.

### *Significance of Site*

High diversity of aquatic invertebrate species (60 taxa) plus 32 fish species make this stream an important feature. Several of these species are considered rare including two dragonflies, one damselfly, one stonefly, and one predaceous diving beetle. Two of these invertebrates are globally rare. The stream is also the main drainage for the southern part of the study area. Robinson Creek Pines State Natural Area protects about one half mile of stream frontage.

### *Management Considerations*

Flowages, especially those associated with cranberry production, are a concern for maintenance of water quality. Changes such as decreased flow, warming temperatures, or chemical contamination are possible in segments downstream from these operations. One dam, maintained for a cranberry flowage, is located in the lower portion of the stream.

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## AQ13. YELLOW RIVER

### ***Location (Within the study area)***

Subsection:	Central Wisconsin Sand Plain (222Ra) and Neilsville Sandstone Plateau (222Rb)
USGS 7.5' Quadrangle:	Kelly, Necedah, New Miner, Finley, Quail Point Flowage, Babcock, Lake Dexter, Pittsville, Lake Manakiki, Spencer South, and Riplinger.
Town-Range-Section:	T17N-R4E, parts of Section 8; T18N-R3E, parts of Sections 1, 12; T19N-R3E, parts of Sections 2-3, 11, 13-14, 24-25, 35-36; T20N-R3E, parts of Sections 3, 10, 15, 22-23, 26, 35; T21N-R3E, parts of Sections 2-3, 10-11, 14-15, 23, 26-27, 34; T22N-R3E, parts of Sections 3, 10, 14-15, 22-23, 26-27, 35.
Size:	Linear feature approximately 64 mi. long; about 26 mi. are in the study area (only 0.5 mi. are in the Sandhill Wildlife Area)

### ***Description of Site***

The major stream of the eastern part of the study area, the Yellow is a medium sized (5<sup>th</sup> to 6<sup>th</sup> order) warm stream with light brown, soft water, and a predominantly sand bottom. This stream originates in Clark County in the agriculture-dominated portion of the Central Plain and is impounded by Lake Dexter in the northern part of the study area. Below Lake Dexter the Yellow is extremely meandered as it enters the bed of Glacial Lake Wisconsin. Development of floodplain forests and oxbow lakes is extensive here. Downstream near Babcock, the Yellow is less meandered until the mouth of Hemlock Creek, where again the Yellow becomes very meandered with numerous oxbow lakes in its floodplain. Below Sprague the channels of the river diverge repeatedly forming a maize of small channels with eventually merge into Necedah Lake.

### ***Significance of Site***

The major stream of the eastern part of the study area the Yellow supports a good diversity of macroinvertebrate species (81) including four designated as Special Concern, plus 40 fish species, one of which is designated Special Concern and is globally rare. Floodplain forest and oxbow lakes associated with the stream corridor are extremely well developed here and provide an abundance of diverse habitats for aquatic and wetland species.

### ***Management Considerations***

Field surveyors noted some significant water quality perturbations including slime and barnyard runoff, as well as less severe impacts due to livestock grazing, croplands, bank erosion, and septic waste. Diversity of macroinvertebrates at some sites sampled was abnormally low. Continued monitoring of this system is recommended.